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Stewart

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(54) **LOWER CORNER CONNECTOR FOR MODULAR SPORTS GOAL**

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(72) Inventor: **Thomas Edward Stewart**, Brampton (CA)

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Related U.S. Application Data

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(51) **Int. Cl.**

A63B 63/00	(2006.01)
A63B 71/02	(2006.01)
F16B 7/04	(2006.01)
F16B 9/02	(2006.01)

(52) **U.S. Cl.**

CPC ***F16B 9/02*** (2013.01); ***A63B 63/004*** (2013.01); ***A63B 71/023*** (2013.01); *A63B 2210/50* (2013.01); *F16B 7/0486* (2013.01); *Y10T 403/42* (2015.01)

(58) **Field of Classification Search**

CPC A63B 63/004; A63B 71/023; A63B 71/028; E04H 12/2238; E04H 12/2269; F16B 9/02

USPC 403/205, 231, 406, 361; 256/65.14; 473/446, 478; 273/400

See application file for complete search history.

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U.S. PATENT DOCUMENTS

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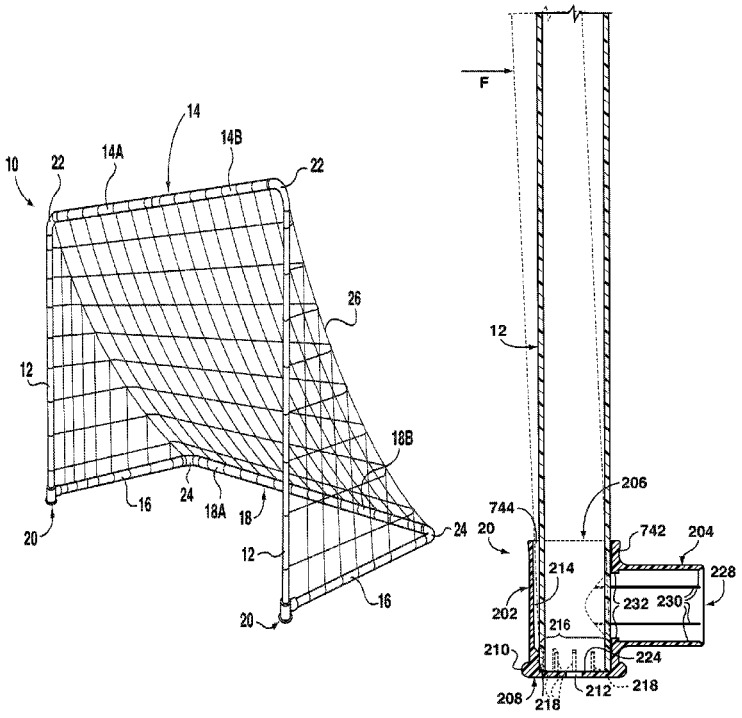
(57) **ABSTRACT**

A lower corner connector for a modular sports goal comprises a first tube having a generally circular inner surface and a second tube extending substantially perpendicularly to the first tube. The first tube has an open end for receiving an upright and a base opposite the open end for resting on a surface. A retainer projects inwardly from the inner surface of the first tube for engaging and retaining the upright and permitting the upright to rock toward and away from the second tube within the first tube to assist in absorbing impact forces.

5 Claims, 4 Drawing Sheets



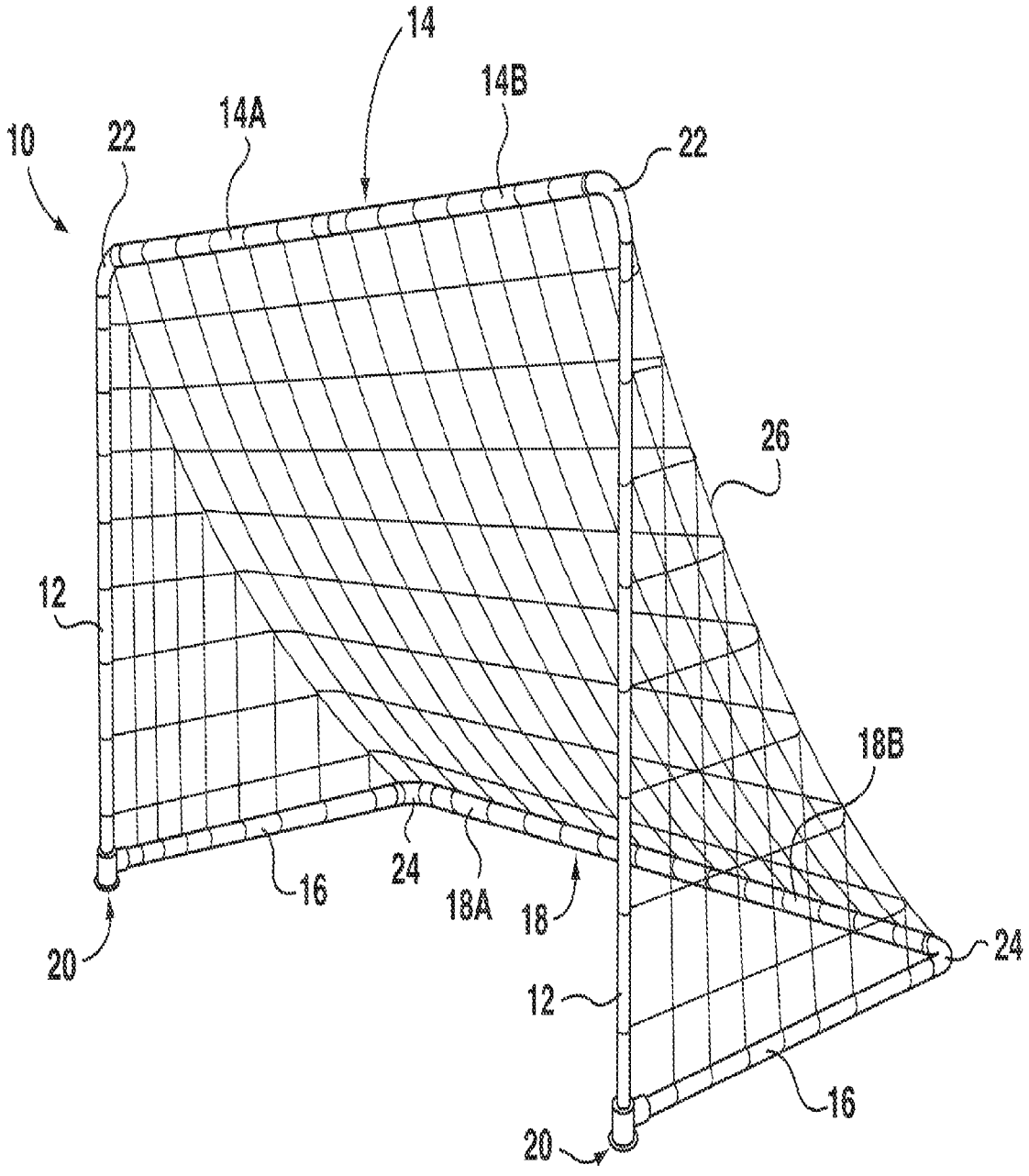


FIG. 1

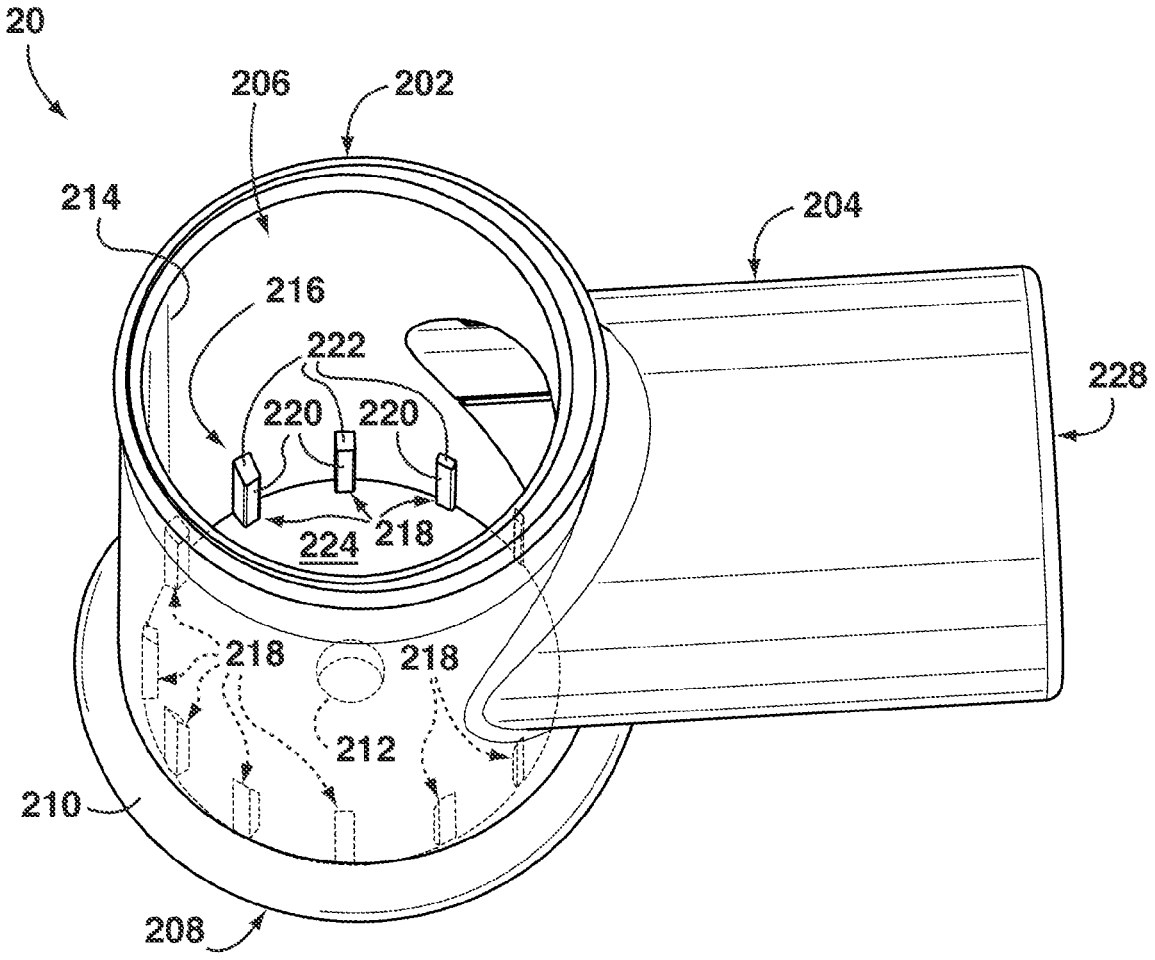

20
206
202
214
204
216
222
228
220
220
224
218
218
218
212
210
208

FIG. 2

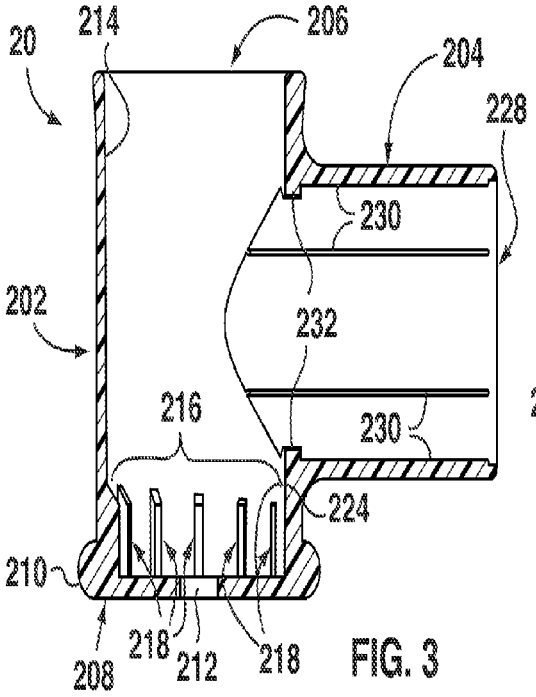


FIG. 3

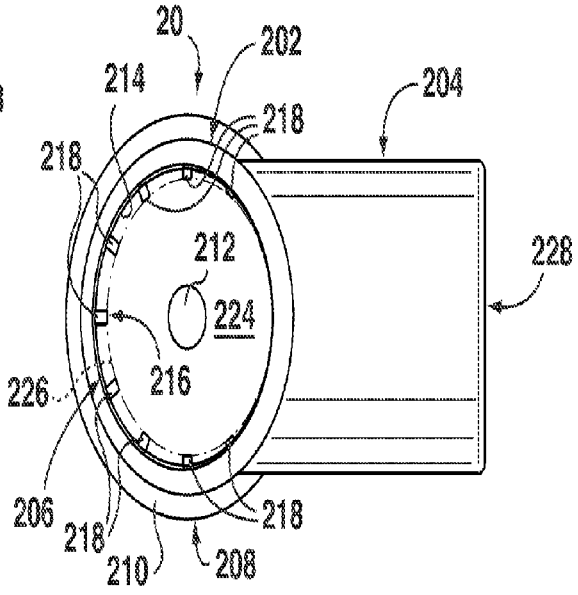


FIG. 4

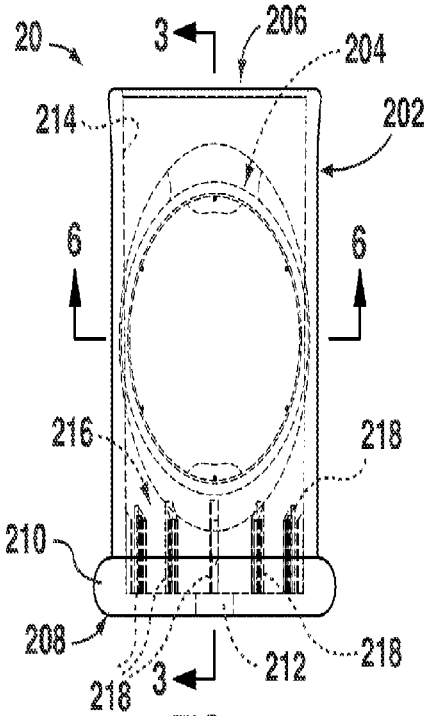


FIG. 5

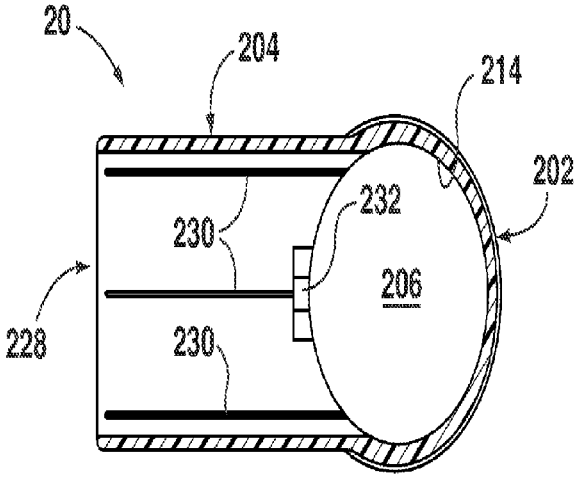


FIG. 6

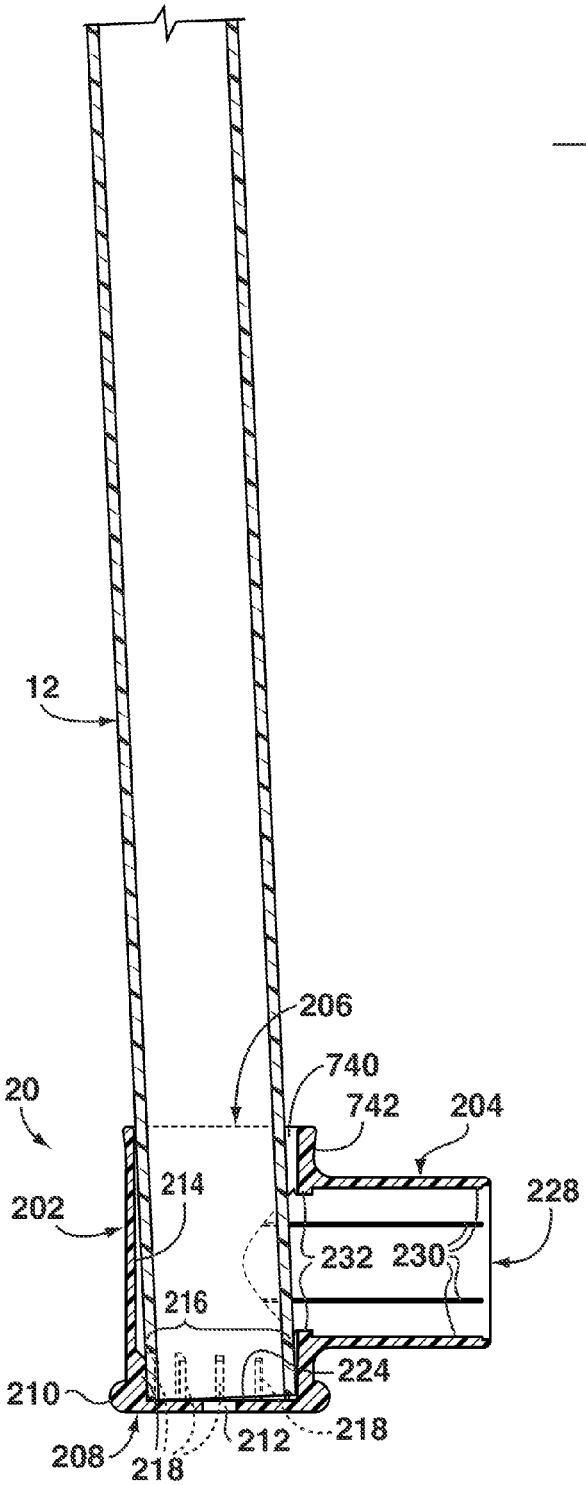

12
206
740
742
204
20
214
202
228
232
230
216
224
210
208
218
212
218

FIG. 7A

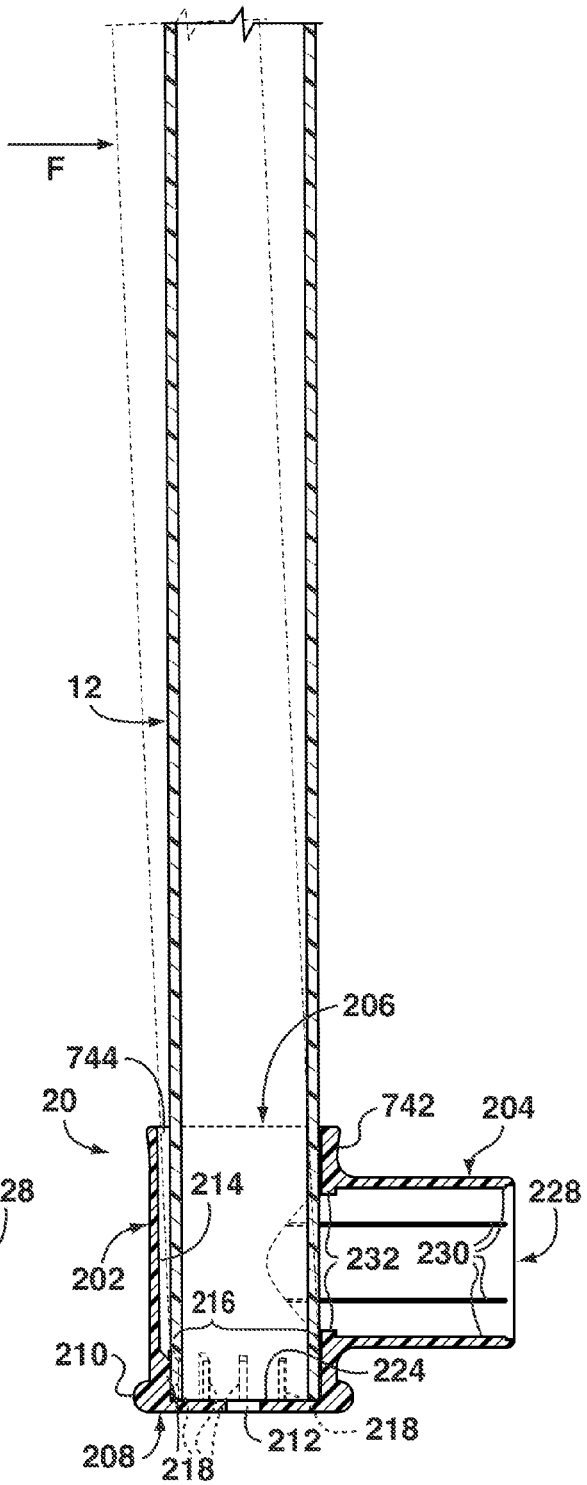

F
12
206
744
742
204
20
214
202
228
232
230
216
224
210
208
218
212
218

FIG. 7B

LOWER CORNER CONNECTOR FOR MODULAR SPORTS GOAL

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of U.S. application Ser. No. 14/720,956, filed May 25, 2015, entitled "LOWER CORNER CONNECTOR FOR MODULAR SPORTS GOAL," which is a Continuation of U.S. application Ser. No. 13/865,063, filed on Apr. 17, 2013, U.S. Pat. No. 9,056,233, issued on Jun. 16, 2015, entitled "LOWER CORNER CONNECTOR FOR MODULAR SPORTS GOAL," the entirety of which are incorporated herein by reference.

TECHNICAL FIELD

The present disclosure relates to modular sports goals, and more particularly to connectors for modular sports goals.

BACKGROUND

A number of modular sports goals are known in the art, for use in games such as soccer, hockey, field hockey, lacrosse and water polo. Typically, such goals comprise a plurality of elongate tubes joined together, either permanently or temporarily (e.g. for the duration of a game) by connectors to form the shape of a goal. Typically the tubes and connectors are made of plastic, aluminum or light steel.

One problem associated with modular sports goals is that a forceful impact, such as from a soccer ball or other sports projectile moving at high velocity, can cause the connectors to break. The impact of a player can also break the connectors, and lead to injury to the player as well.

One example of a modular sports goal directed to addressing this problem is disclosed in U.S. Pat. No. 5,857,928 to Stewart, which teaches a portable soccer practice goal net which uses specialized struts to assist in absorbing impact forces. While these struts can address the problem of breakage, they increase the complexity of the goal structure considerably. This increased complexity makes it more difficult for younger players to assemble the goal from a disassembled form, and also makes it more difficult to transport the disassembled goal, since there are a greater number of parts. Moreover, the struts must have sufficient thickness to provide the required breakage resistance, thereby increasing the weight of the goal system with further adverse effects on transportability.

SUMMARY

A lower corner connector for a modular sports goal allows an upright of the goal to rock backward under impact while remaining firmly retained in the lower corner connector, thereby reducing the risk of damage.

The lower corner connector comprises a first tube having a generally circular inner surface and a second tube extending substantially perpendicularly to the first tube. The first tube has an open end for receiving an upright and a base opposite the open end for resting on a surface. A retainer projects inwardly from the inner surface of the first tube for engaging and retaining the upright and permitting the upright to rock toward and away from the second tube within the first tube to assist in absorbing impact forces.

In one embodiment, the retainer comprises a plurality of circumferentially spaced individual projections, and these projections may increase in radial length with increasing circumferential distance from the second tube. The projections may define a notional circle of smaller diameter than the inner surface and which is non-concentric with the inner surface and offset toward the second tube. In a particular embodiment, the circumference of the notional circle intersects the circumference of the inner surface adjacent the second tube.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features will become more apparent from the following description in which reference is made to the appended drawings wherein:

FIG. **1** is a perspective view of an exemplary modular sports goal incorporating exemplary corner connectors as described herein;

FIG. **2** is a top perspective view of one of the exemplary corner connectors shown in FIG. **1**;

FIG. **3** is cross-sectional view of the corner connector of FIG. **2**, taken along the line **3-3** in FIG. **5**;

FIG. **4** is a top view of the corner connector of FIG. **2**;

FIG. **5** is a front view of the corner connector of FIG. **2**;

FIG. **6** is cross-sectional view of the corner connector of FIG. **2**, taken along the line **6-6** in FIG. **5**;

FIG. **7**A is a side cross-sectional view of the corner connector of FIG. **2**, with an upright received therein in a first position; and

FIG. **7**B is a side cross-sectional view of the corner connector of FIG. **2**, with the upright received therein in a second position.

DETAILED DESCRIPTION

Reference is now made to FIG. **1**, in which an exemplary modular sports goal is indicated generally by reference **10**. The sports goal **10** comprises two parallel elongate tubular uprights **12**, two elongate tubular crossbar members **14**A, **14**B joined to form a crossbar **14**, two elongate tubular rear support members **16**, and two elongate tubular rear cross support members **18**A, **18**B joined together to form a rear cross support **18**. The uprights **12** are secured in respective lower corner connectors **20**, and the crossbar **14** extends between the two uprights **12** and is joined to the upper ends of the uprights by two elbow-shaped crossbar connectors **22**. The rear support members **16** are also secured in the lower corner connectors **20**, and extend away from the uprights **12** and the crossbar **14** substantially perpendicularly to the uprights **12** and the crossbar **14**. The rear cross support **18** extends between the rear support members **16**, substantially parallel to the crossbar **14**, and is joined to the rearmost ends of the rear support members **16**, that is, the ends furthest from the lower corner connectors **20**, by two elbow-shaped rear support connectors **24**. In one embodiment, the uprights **12** and the crossbar members **14**A, **14**B are friction fit into the crossbar connectors **22** and the rear support members **16** and the rear cross support members **18**A, **18**B are friction fit into the rear support connectors **24**. One of the crossbar members **14**A, **14**B may be friction fit into the other to form the crossbar **14**, and similarly one of the rear cross support members **18**A, **18**B may be friction fit into the other to form the rear cross support **18**. Certain ends of the respective members may include an inwardly stepped portion of reduced diameter to facilitate the friction fit while maintaining a substantially constant outer diameter. A net **26** may be

attached to the modular sports goal **10** in known manner. Optionally, for ease of manufacturing, the elbow-shaped crossbar connectors **22** and elbow-shaped rear support connectors **24** may be replaced by additional lower corner connectors **20** so that only one type of connector is used.

Reference is now made to FIGS. **2** to **6**. FIGS. **2** to **6** show the exemplary lower corner connector **20** for a modular sports goal. The lower corner connector **20** comprises a first tube **202** and a second tube **204** extending substantially perpendicularly to the first tube **202**. The first tube **202** has an open end **206** for receiving an upright, such as the upright **12** in FIG. **1**, and a base **208** opposite the open end **206** for resting on a surface such as a sports field. In the illustrated embodiment, the base **208** forms a toroidal flange **210** and substantially closes the end of the first tube **202** opposite the open end **206**, save for a central aperture **212**, opposite the open end **206** of the first tube **202**, and as such the base **208** will serve as a stop and supports an upright when fully inserted into the first tube. In other embodiments, the base may be completely closed, or the first tube **202** may have two open ends with one of the open ends serving as the base, and may be provided with one or more stops for supporting an upright.

As best seen in FIGS. **2**, **4** and **6**, the first tube **202** has a generally circular inner surface **214**. Although in the illustrated embodiment the inner surface **214** is precisely circular, the term "generally circular", as used in reference to the inner surface of the first tube **202**, is not limited to precisely circular or even curvilinear forms; the term "generally circular" in this context also includes suitable regular polygonal shapes defining an inscribed circle. Similarly, the outer surface of the first tube is not limited to any particular shape.

Continuing to refer to FIGS. **2**, **4** and **6**, a retainer **216** projects inwardly from the inner surface **214** of the first tube **202**. As will be explained in greater detail below, the retainer **216** can, in cooperation with the inner surface **214** of the first tube **202**, engage an upright such as the upright **12** in FIG. **1** in a friction fit or interference fit to retain the upright within the first tube **202**. In the illustrated embodiment, the retainer **216** comprises a plurality of circumferentially spaced individual projections **218** that extend radially inwardly from the inner surface **214** of the first tube **202**. In the illustrated embodiment, the projections **218** are also connected to the flat inner portion **224** of the base **208**. As best seen in FIG. **2**, each of the projections **218** forms a flat engagement surface **220** for engaging an upright and a sloping portion **222** distal from the base **208** that slopes from the engagement surface **220** toward the inner surface **214** of the first tube **202**.

As best seen in FIG. **4**, the projections **218** increase in radial length with increasing circumferential distance from the second tube **204**, with the radially longest projection **218** being directly opposite the second tube **204**, and with no projection beneath the axially central portion of the second tube **204**. The projections **218**, in particular the engagement surfaces thereof, define a notional circle **226** (FIG. **4**) of smaller diameter than the inner surface **214**. The notional circle **226** is preferably non-concentric with the inner surface **214** and offset toward the second tube **204**. Also preferably, the circumference of the notional circle **226** intersects the circumference of the circle defined by the inner surface **214**, adjacent the second tube **202**. When the inner surface of the first tube **202** has a regular polygonal shape, the notional circle defined by the retainer would be smaller than the inscribed circle defined by the polygon and non-concentric with that inscribed circle, preferably intersecting that inscribed circle.

Although in the illustrated embodiment the retainer **216** takes the form of a plurality of individual projections, other types of retainers may also be used. For example, a continuous crescent-shaped retainer defining a notional circle of smaller diameter than the inner surface may be used instead of the projections **218**.

As best seen in FIGS. **3** and **6**, in the illustrated embodiment the distal end **228** of the second tube **204**, relative to the first tube **202**, is open to receive a rear support member, such as one of the rear support members **16**, within the second tube **204**. A plurality of elongate, spaced apart ribs **230** extend radially inwardly from the inner surface of the second tube **204** and run substantially along the length of the second tube **204** to engage the outer surface of a rear support member and assist in retaining it within the second tube **204** in a friction fit or interference fit. The ribs **230** terminate just short of the distal end **228** of the second tube **204** to facilitate insertion of the rear support member therein. Two opposed inwardly projecting stops **232** at the junction between the first tube **202** and the second tube **204** inhibit a rear support member from being inserted beyond the proximal end **234** of the second tube **204** into the first tube **202**. The second tube **204** may or may not open into the first tube **202**. In other embodiments, the distal end of the second tube may be closed, and the second tube may be friction fit or interference fit into the open end of a rear support member. As with the first tube, neither the inner or outer surfaces of the second tube are limited to any particular shape.

Reference is now made to FIGS. **7**A and **7**B, which show how the structure of the retainer **216** permits an upright **12** to rock toward and away from the second tube **204** within the first tube **202** while being securely retained within the first tube **204** by the retainer **216** in cooperation with a part of the inner wall **214** of the first tube **202**. FIG. **7**A shows the upright **12** in a forwardly rocked position, and FIG. **7**B shows the upright in a rearwardly rocked position.

In the forwardly rocked position shown in FIG. **7**A, the upright **12** leans slightly away from the second tube **204** and there is a gap **740** between the outside surface of the upright **12** and the inner surface **214** of the first tube **202** above and adjacent the second tube **204**. The upright engages the inner surface **214** of the first tube **202** at the open upper end **206** thereof, and the upright **12** is securely retained in the first tube by the retainer **216** in cooperation with the inner surface **214** of the first tube **202** beneath the second tube **204**.

If the upright **12** or a crossbar is struck by a ball or other sports projectile moving generally toward the second tube **204**, as indicated by force arrow F in FIG. **7**B, the upright **12** can rock backward within the first tube **202** while continuing to be securely retained in the first tube by the retainer **216** in cooperation with the inner surface **214** of the first tube **202** beneath the second tube **204**. Thus, the upright **12** moves into the gap **740** between the outside surface of the upright **12** and the inner surface **214** of the first tube **202** above and adjacent the second tube **204**, creating a new gap **742** between the outside surface of the upright **12** and the inner surface **214** of the first tube **202** opposite the second tube **204**. This allows impact force to be absorbed and reduces the risk that the lower corner connector **20** will break. To facilitate this rocking, the diameter of the inner surface **214** of the first tube **202** may be slightly larger toward the open end **206** of the first tube **202** than toward the base **208**. Preferably, the portion **742** of the wall of the first tube **202** above and adjacent the second tube **204** is thick-

ened, relative to the remainder of the wall of first tube **202**, to provide increased strength (see also FIG. **3**). This may be achieved, for example, by having the diameter of the inner surface **214** slightly offset away from the second tube **204**, relative to the outer diameter of the first tube **202**. After an impact, the upright **12** can be manually reset to the position shown in FIG. **7**A.

In one embodiment, a corner connector as described herein may be made from suitable plastic materials, such as polypropylene, and is preferably of monolithic construction. Other suitable materials may also be used.

In one embodiment, the first tube is 3.5 inches long from the open end **206** to the flat inner portion **224** of the base **208**, which is 0.150 inches thick, and the diameter of the inner surface **214** of the first tube **202** is 2.066 inches between the base **208** the second tube **204** and 2.121 inches at the open end **206**. In this embodiment, the notional circle **226** defined by the projections **218** has a diameter of 1.919 inches, and the engagement portions **220** of the projections **218** extend 0.501 inches from the flat inner portion **224** of the base **208**. These are merely exemplary dimensions provided for illustrative purposes, and are not intended to be limiting in any way.

Certain currently preferred embodiments have been described by way of example. It will be apparent to persons skilled in the art that a number of variations and modifications can be made without departing from the scope of the invention as defined in the claims.

What is claimed is:

1. A lower corner connector for a modular sports goal, comprising:

a first tube having a generally circular inner surface;

the first tube having an open end and a base opposite the open end for resting on a surface;

a second tube extending substantially perpendicularly to the first tube; and,

a retainer projecting inwardly from the inner surface of the first tube;

the retainer located adjacent the base of the first tube and distal from the open end of the first tube and defining a notional circle of smaller diameter than the inner surface;

whereby the retainer results in a smaller diameter adjacent the base of the first tube than at the open end of the first tube; and

wherein an upright is capable of being received in the open end of the first tube inside the first tube so that the retainer engages an outer wall of the upright and thereby retains the upright with the outer wall thereof inwardly spaced from an inner wall of the open end of the first tube such that the upright is permitted to rock toward and away from the second tube within the first tube.

2. The lower corner connector of claim **1**, wherein the retainer comprises a plurality of circumferentially spaced individual projections.

3. The lower corner connector of claim **2**, wherein the projections increase in radial length with increasing circumferential distance from the second tube.

4. The lower corner connector of claim **2**, wherein:

the projections define a notional circle of smaller diameter than the inner surface;

the notional circle being non-concentric with the inner surface and offset toward the second tube.

5. The lower corner connector of claim **4**, wherein a circumference of the notional circle intersects a circumference of the inner surface adjacent the second tube.

* * * * *